

## SECTION 13: FIRE PROTECTION

13.1 General. This section provides fire protection engineering policy and design guidance for all medical facilities including hospitals, medical centers, composite medical facilities, occupational health clinics, free-standing outpatient health and dental clinics, flight medicine clinics, and other facilities for inpatient, emergency and ambulatory care. This section also provides fire protection engineering policy and design guidance for medical support facilities such as, blood storage and medical warehouses, medical laboratories and medical research laboratories, and veterinary care facilities. This section does not apply to contingency facilities. The level of protection afforded these facilities is minimum, austere, but adequate, given the least stringent requirement, which safely protects the contents of the contingency facility. (Refer to Section 1 for description of contingency facility.)

13.2 Criteria.

13.2.1 Life Safety and Fire Protection Concepts. The life safety concept and the fire protection concept shall be in accordance with NFPA 101 (reference 13a).

13.2.2 Codes and Standards. Except as modified herein, designs for facilities shall comply with the latest edition of MIL-HDBK-1008 (reference 13b), the standards contained in the current National Fire Codes published by the National Fire Protection Association (NFPA), the Uniform Building Code published by the International Conference of Building Officials, and the Joint Commission on Accreditation of Health Care Organizations (JCAHO) Manual (reference 13c) and National Institute of Standards and Technology (NIST) publications.

13.2.3 Fire Safety Evaluation System (FSES). NFPA 101A (reference 13d) may be used to assess existing facilities and for design concept development of Life Safety Code upgrade projects at existing facilities. NFPA 101A (reference 13d) may be considered for semi-permanent and contingency facilities if approved by the appropriate Design Agent and TMA/DMFO. NFPA 101A will not be used in lieu of prescriptive code criteria for the design of new permanent facilities.

13.2.4 Criteria Deviation. Where valid need exists and an alternate solution involving equivalent concepts and sound fire protection engineering are available, criteria deviation may be accepted after approval by the Authority Having Jurisdiction (AHJ) as identified at MIL-HDBK-1008 in conjunction with TMA/DMFO. Where deviation impacts compliance with JCAHO standards, coordination with and approval of Joint Commission Standards Group must be obtained prior to implementation.

13.3 Building Construction. Building construction shall be as specified in MIL-HDBK-1008 (reference 13b).

13.3.1 General Requirements. Medical facilities shall be noncombustible construction in which structural framing, walls, partitions and major components are wholly of noncombustible materials or assemblies. Minor components may be combustible material when not inconsistent with the codes and standards referenced above.

13.3.1.1 Type of Construction. Type of Construction shall comply with the following minimum requirements:

- a) Medical centers, hospitals, composite medical facilities, and ambulatory health care facilities.

- 1) Four or more stories - Type I
- 2) Two or three stories - Type II-Fire Resistive
- 3) Single story - Type II-One Hour

b) Outpatient health and dental clinics, laboratories, research facilities and veterinary care facilities.

- 1) Three stories or more - Type II-Fire Resistive
- 2) One or two stories - Type II-N

Exception No. 1: Medical facilities designed and constructed in accordance with the requirements of the Integrated Building System (IBS), with a walk-on platform which provides access to the distribution zone (interstitial space), shall meet the criteria of NFPA 101 and NFPA 220.

Exception No. 2: Medical facilities classified as Occupancy Group B may consist of Types III, IV, or V construction if the total floor area does not exceed 8000 square feet. Allowable area increases are not permitted.

13.3.2 Building Height/Allowable Floor Area. Building height and allowable floor area limitations shall be in accordance with MIL-HDBK-1008 (reference 13b).

Exception: Medical facilities designed and constructed in accordance with the requirements of the Integrated Building System shall meet the fire and smoke compartmentation requirements and height limitations of NFPA 101.

13.3.3 Existing Facilities. Existing facilities shall be evaluated by a qualified fire protection engineer as defined by MIL-HDBK-1008 in order to determine the level of fire/life safety that is afforded the occupants.

13.3.3.1 Alterations and Renovations. To the extent possible, alteration, renovation, modernization and rehabilitation work of existing facilities shall comply with the requirements for NEW construction in accordance with MIL-HDBK-1008 (reference 13b). Additions shall be separated by 2-hour fire resistive construction from any existing structure that is not in compliance with current codes and standards. No additions, alteration or modernization project shall lessen the fire/life safety of the existing building.

13.3.3.2 Life Safety Upgrade and Fire Protection Assessment. To remain unchanged, existing facilities shall comply with the requirements for EXISTING construction requirements of NFPA 101 (reference 13a). It is intended that facilities, not in compliance with the EXISTING construction requirements of NFPA 101, be upgraded to meet the NFPA 101 requirements for NEW construction. However, if cost to upgrade to NEW construction criteria is determined prohibitive, DoD authorization must be obtained and coordinated for upgrade to EXISTING construction requirements based upon submission and approval of a fire and life safety assessment, and an \*economic analysis. In any case, the minimum level of fire safety for upgrade of existing facilities shall comply with EXISTING construction requirements of NFPA 101 (reference 13a). A Life Safety Assessment (LSA) shall be performed in coordination with the JCAHO Statement of Conditions.

\*NOTE: The economic analysis shall include comparative analysis of at least three different life safety assessment solutions for NFPA 101 compliance in accordance with JCAHO Standards. Economic Analysis shall include cost estimates supporting the following:

- complete prescriptive compliance with NEW construction criteria,
- complete prescriptive compliance with EXISTING construction criteria, and

- compliance with other equivalent alternative life safety solutions.

a) Assessment Process. The process of determining compliance with NFPA 101 (reference 13a) may be facilitated by the use of JCAHO's (reference 13c) "Statement of Conditions" document. Part 3 of the document is the "Life Safety Assessment (LSA)" section, which consists of a check list form designed to assess compliance with the Life Safety Code. The document provides a systematic method of evaluating compliance, and each check list line item addresses a particular fire/life safety feature and includes the applicable reference paragraph or section of NFPA 101 (reference 13a).

b) Compliance Equivalency. Facilities determined not to comply with NFPA 101 (reference 13a) for existing occupancies may be reevaluated utilizing NFPA 101A (reference 13d). The Fire Safety Evaluation System (FSSES) methodology may be used to determine if existing conditions and systems are equivalent to the Life Safety Code requirements.

c) Compliance. Facilities and/or facility feature(s) determined not to comply with NFPA 101 (reference 13a), and determined not to be equivalent to NFPA 101 (reference 13a) by means of NFPA 101A (reference 13d), shall be corrected. Corrections may be facilitated by the use of the JCAHO's Statement of Conditions, Part 4, "Plan for Improvement (PFI)". The PFI should be maintained and updated on a regular basis or as recommended by the JCAHO.

13.3.4 Construction Operations. Fire protection and life safety provisions shall be provided during construction as specified by MIL-HDBK-1008, the National Fire Protection Association Codes and Standards, and the Interim Life Safety Measures (ILSM) of the JCAHO Manual (reference 13c). When a facility is to be occupied during a renovation, alteration or upgrade, consideration shall be given to the potential impact on life safety in occupied areas. Construction and demolition phasing shall be planned so that the integrity of fire and smoke partitions, exits, stairways, and vertical shafts, which are contiguous with inpatient areas, are maintained to the highest level possible. Appropriate safety measures in accordance with NFPA 101 (reference 13a) and NFPA 241 (reference 13q) will be incorporated into temporary structures.

13.4 Occupancy Classification. Occupancy classification of medical facilities shall be defined by NFPA 101 (reference 13a). Facilities or portions of facilities, which are not required to be health care occupancy, may be classified as other occupancies provided that the requirements of NFPA 101 are satisfied.

13.5 Means of Egress. Facilities shall meet the requirements of the Life Safety Code, NFPA 101 (reference 13a).

13.5.1 Horizontal Exits. Floors with inpatient sleeping rooms shall utilize horizontal exits to the fullest extent possible to maximize "defend-in-place" evacuation.

13.5.2 Areas of Refuge. Total evacuation of the occupants to the outside of the building is often impractical for inpatients located on upper floors. Therefore, areas of refuge shall be implemented through the use of smoke compartmentation when a rapid and complete evacuation is not feasible.

13.6 Interior Finishes. Interior wall, ceiling and floor finishes, and movable partitions shall conform to MIL-HDBK-1008 (reference 13b).

13.6.1 Carpeting. Carpeting and other textile wall coverings shall not be utilized on walls in smoke compartments with sleeping areas and shall not be utilized in other areas except as allowed by MIL-HDBK-1008 (reference 13b).

13.7 Fire Detection and Alarm Systems (FDAS). Fire alarm systems shall be provided for all medical facilities in accordance with MIL-HDBK-1008 (reference 13b), and NFPA 101 (reference 13a), NFPA 99 (reference 13e), and NFPA 90A (reference 13f). These systems shall be installed in accordance with NFPA 72 (reference 13g) and NFPA 70 (reference 13n).

NOTE: Combining FDAS with other building systems such as building automation, energy management, security, etc, is not permitted. Down-time caused by any of these non-life safety systems will also take the FDAS out of service which is unacceptable.

13.7.1 Clinics. Free standing clinics shall be provided with a supervised, manually operated, non-coded general fire alarm system. Exception: Large clinics over 50,000 square feet may be provided with a coded system.

13.7.2 Fire Alarm System Zoning. Each smoke compartment shall be zoned (annunciated at the FDAS panel and at any remote annunciator panels) separately. Maximum area of each smoke compartment shall be as required by NFPA 101 (reference 13a).

13.7.3 Alarm Indicators and Control Panels. Locate the main control panel at the emergency area reception desk or at a 24-hour supervised location and coordinated with the facility. Large medical facilities may require additional locator panels at designated nursing stations and major lobbies. The fire detection system panel shall be provided with audible signals for power failure, open circuit, ground, smoke detector failure, sprinkler valve water-flow detection, and fire pumps.

13.7.4 Automatic Smoke Detection. Smoke detection shall be provided where required in accordance with NFPA 101 (reference 13a), NFPA 101A (reference 13d), NFPA 90A (reference 13f), NFPA 72 (reference 13g), ASTM A17.1 (reference 13r) and MIL-HDBK-1008 (reference 13b). Where many smoke detectors are required to be installed, analog addressable systems are encouraged. Spot type, ceiling mounted smoke detectors shall be photoelectric type.

NOTE: Smoke detection systems require significant testing and maintenance. It is critical that required detectors are properly installed and maintained. Providing detectors in locations that are not required increases the already high maintenance costs of alarm systems and strains the maintenance program for critical detection systems. If a facility or design warrants protection and criteria do not require detection, protection should be accomplished by sprinkler protection, preferably wet pipe sprinklers which provide superior protection with very little maintenance.

13.7.5 Manual Fire Alarm Boxes. Manual alarm initiation stations shall be located within 5 feet of each stairway exit door, exit doors to the outside, horizontal exits and normal means of egress, and shall comply with the requirements of NFPA 72 (reference 13g) and NFPA 101 (reference 13a).

13.7.6 Occupant Notification. Where "defend-in-place" evacuation is provided, alarm signals shall be coded. Audible notification device shall not be located within surgical operating rooms. Provide subdued audible indicating appliances in critical care areas.

13.7.6.1 Visual Alarms. Visual alarm notification is required for all medical facilities in accordance with NFPA 101. Visual alarms shall be in view of all nurses stations, exits, and at locations such as mechanical rooms where the operating noise levels (sound pressure) exceed the level of the audible alarm. For facilities that have a fire safety evacuation plan, which

includes occupant notification by trained staff personnel, visible notification appliances are required only in public accessible areas (including corridors and hallways, lounges and lobbies, cafeterias, auditoriums, large conference rooms and public restrooms). For those facilities that do not have an evacuation plan, visible notification appliances shall be provided in all public accessible and patient accessible areas including exam and treatment rooms. Visual alarms are not required in areas that are used only by employees as work areas (individual offices, work stations) and staff-only spaces. Alterations for future accessibility must be considered when facility wiring is planned to facilitate a later connection to the building FDAS.

NOTE: Previous guidance was stipulated based upon occupancy classification. This criteria is applicable to all occupancies in which occupants are provided medical treatment.

13.7.7 Fire Department Notification. Systems shall be connected to the base fire department, or when not available, to a suitable location where responsible personnel are continuously on duty.

13.7.8 Electrical Power Supply. FDAS primary electrical power supply shall be provided from the life safety branch of the essential electrical system in facilities equipped with generator backup. Secondary electrical power shall be by means of battery backup.

13.8 Smoke Control Systems. Smoke control systems shall conform to NFPA 92A (reference 13h), NFPA 92B (reference 13i) and the appropriate sections of NFPA 101 (reference 13a). When a smoke detection system is used to initiate smoke control, it shall conform to the recommendations of NFPA 72 (reference 13g).

13.9 Automatic Sprinkler Protection. All facilities shall be protected throughout by an approved automatic sprinkler system provided in accordance with NFPA 13 (reference 13j) and MIL-HDBK-1008 (reference 13b). Sprinkler systems shall be installed throughout all medical facility spaces and rooms, including elevator machine rooms, walk-in freezers and cold rooms, computer rooms, telephone switch rooms, radiology and MRI suites, loading docks, electrical rooms, audio-metric booths (except where constructed and listed with a one hour fire rating), vaults, paint spray booths, dry type lint collectors, dust collectors, and generator rooms. Sprinklers are not required where specifically exempted by NFPA 13, and in:

Exception No 1: Stand-alone, detached facilities, classified as business occupancies, less than three stories in height and of Type I (FR), Type II (FR) or Type II (One Hr) construction.

Exception No 2: Distribution zone and connection zone (space above suspended ceiling) of facilities designed and constructed in accordance with the requirements of the Integrated Building System. (Refer to Chapter 19 for IBS configuration criteria.) Distribution Zone spaces which require sprinklers, include electrical and communication closets, etc., and automatic box conveyor (ABC) rails and electric track vehicle systems (ETVS) tracks located within interstitial space over which a single line of sprinklers with no greater than 6 ft. spacing shall be installed.

13.9.1 Elevators. Install sprinklers in elevator pits and machine rooms only where required by NFPA 13. Sprinklers are not required at the top of elevator hoistways. Install standard sprinklers with intermediate temperature rating of 200°F or higher in elevator pits and machine rooms. The sprinkler system shall be interfaced with elevator lobby smoke detectors for

elevator recall, and with heat detector(s) and sprinklers for elevator electrical power shutdown requirements (shunt-trips).

13.9.2 Sprinkler System Zoning. Sprinkler systems shall be zoned by floor (at a minimum) for multi-story facilities. Zoning and system controls shall also correspond to smoke compartments, where provided. All sprinklers in a smoke compartment shall be piped as one system with one control valve and waterflow switch. Zoning shall also correspond to the fire alarm zoning.

13.9.3 Sprinkler System Design. New sprinkler systems that provide coverage of 1,500 square feet or greater, shall be designed by utilizing hydraulic calculation methodology, in accordance with NFPA 13 (reference 13j). The NFPA 13 special design approach shall not be used in health care facilities. Sprinkler design densities and corresponding remote design areas shall be in accordance with MIL-HDBK-1008 and as follows:

- a) Smoke compartments with sleeping and treatment areas: Light Hazard.
- b) Dining areas and kitchens: Ordinary Hazard Group 1.
- c) Storage rooms, record storage, laundry rooms, mechanical rooms and similar rooms greater than 100 sq. ft: Ordinary Hazard Group 1.
- d) Shops other than woodworking shops: Ordinary Hazard Group 1.
- e) Woodworking shops: Ordinary Hazard Group 2.
- f) Boiler rooms: Ordinary Hazard Group 2.
- g) High hazard spaces: Ordinary Hazard Group 2.
- h) Bulk supply storage (Maximum height of 12 ft): Extra Hazard Group 1.
- i) Rooms containing movable/mobile shelving/high density storage: Ordinary Hazard Group 2.
- j) Laboratories with installations for use of flammable gas: Ordinary Hazard Group 2.

13.9.4 Kitchen and Food Service Equipment. Extinguishing systems shall be provided in food preparation areas. Self-cleaning water-wash ventilators with water-spray fire protection systems shall be used to protect cooking surfaces, ducts, grease removal devices, and range hoods in accordance with NFPA 96 (reference 13k).

NOTE: Water spray is permitted by NFPA 96 for protecting cooking surfaces and grease-laden exhaust ducts. Use of water reduces downtime of kitchen operations because of ease of cleanup.

13.10 Standpipes. Standpipe systems shall be provided in buildings 4 stories (40 ft in height) or greater, or in buildings where fire department access may be difficult, in accordance with MIL-HDBK-1008 (reference 13b) and NFPA 14 (reference 13s). Water supplies shall also be in accordance with MIL-HDBK-1008 (reference 13b).

13.11 Electronic Communications and Automatic Data Processing (ADP) Installations. Rooms and areas housing EPABX equipment or other electronic communications, large rooms containing ADP equipment, and electronic equipment providing control of critical medical equipment (i.e., MRI, CT Scanner) shall meet the requirements of NFPA 75 (reference 13l) and be protected in accordance with MIL-HDBK-1008 (reference 13b).

13.11.1 Automatic and Manual Controls. Controls to disconnect power to all electronic equipment and shut down the air conditioning system shall be provided.

13.11.2 Halon Fire Extinguishing Systems. Use of Halon fire extinguishing systems is prohibited.

13.12 Atriums/Malls. Atriums and medical malls shall meet the requirements of NFPA 101 (reference 13a) and shall be designed to comply with NFPA 92B (reference 13i).

13.13 Protection From Hazards. Protection from hazards shall be in accordance with MIL-HDBK-1008. Storage rooms shall be considered hazardous areas and comply with appropriate occupancy chapter requirements of NFPA 101.

13.13.1 Flammable and Combustible Liquid Storage. Flammable and combustible liquid storage must be in a fire resistance rated enclosure complying with NFPA 30.

13.13.2 Gas Storage. Flammable gas storage must be in a fire resistance rated enclosure complying with NFPA 99. Nonflammable medical gas storage must be in a fire resistance rated enclosure complying with NFPA 99.

13.13.2.1 Oxygen Storage. Oxygen storage rooms must be located at least 50 feet from flammable storage rooms.

13.14 Integrated Building Systems (IBS). For a functional description of the various elements of the Integrated Building System refer to Section 19.

13.14.1 Requirements. Fire safety requirements for facilities designed using the Integrated Building System (IBS) shall be in accordance with the same codes and standards applicable to any non-IBS facility. The following IBS criteria is based upon a special study titled Fire Performance of Interstitial Space Construction System (NBSIR 85-3158) (reference 13m), conducted by the National Institute of Standards and Technology (NIST). The IBS criteria herein is coordinated with the requirements of the referenced codes and standards to accommodate the nontraditional characteristics of the IBS approach. Where variations between this standard and other applicable codes and standards occur, the fire safety design requirements for IBS facilities indicated herein, shall govern.

Basic Concept. In IBS designs, as in traditional building configurations, smoke compartments are separated by fire-rated smoke barriers. The area of an IBS module, i.e. smoke compartment, can be no greater than 22,500 sq. ft. The IBS modular zones which require smoke barrier separation for smoke compartmentation are the occupied and connection zones. Neither, the distribution zone, nor the utility pod is required to be subdivided by smoke barriers. In addition to this section, refer to Section 19, Integrated Building System, for a description of the IBS configurations, modules and zones.

NOTE 1: The integration of IBS facility building modules with NFPA smoke compartmentation requirements is a basic fire protection/life safety principle of this non-traditional building concept. When applying NFPA 101, the modular configuration of the IBS is a significant benefit because compartmentation becomes a natural byproduct.

NOTE 2: Coordination of Systems. Supply services to any system module shall serve an area that corresponds to the smoke compartment, including electrical power, fire alarm zoning, automatic sprinkler zoning, and HVAC zoning. Supply services are defined as utilities, i.e., water supply, electrical power and medical gases that originate outside of the module, feeding utilities which are centrally located in the utility pod of each system module and then distributed to each functional zone via the distribution zone of each system module.

NOTE 3: Number of Stories. The walk-on platforms constituting the floor level of the distribution zones do not constitute separate stories. Each occupied zone and its corresponding floor is counted as an independent floor level.

#### 13.14.2 Construction.

13.14.2.1 Floor-to-Floor Fire Separation. A 2 hour fire resistive separation is required between floors. The fire resistance rating runs in a horizontal plane along the utility pod floor, then vertically along the wall separating the utility pod from the occupied zone and connection zone. The fire resistance rating then continues along the walk-on platform to the outside wall. The walk-on platform of the distribution zone shall be designed in accordance with NBSIR 85-3158 (reference 13m). See Figure 13-1.

#### 13.14.2.2 Occupied Zone.

a) The building modules of IBS facilities at the occupied zone shall be the designated smoke compartments separated from each other by 1 hour fire rated construction. These separations shall meet the smoke barrier requirements of NFPA 101 (reference 13a).

b) Walls, smoke barrier partitions, occupancy separations (not greater than 2 hour fire resistance) and horizontal exit walls shall terminate at the bottom of the walk-on platform. Occupancy separations (2 hour fire resistance and greater) of multi-story facilities shall not terminate at the walk-on platform, but pass continuously through the distribution zone and structural floor and terminate at the bottom of the occupied zone floor above.

#### 13.14.2.3 Distribution Zone.

a) Dividing the distribution zone into smoke compartments with smoke barriers is not required.

b) Horizontal exit or smoke barrier walls, located in the occupied/connection zone need not be extended up into the Distribution Zone.

#### 13.14.2.4 Utility Pods.

a) Utility Pods shall be separated from the distribution zones by 1 hour fire rated construction and from the occupied and connection zones by 2 hour fire resistive construction.

b) The structural members in the utility pod shall have a 2 hour fire resistive rating.

#### 13.14.2.5 Structural Members.

a) Columns. All columns shall be provided with the required degrees of fire resistance within all zones.

b) Occupied Zone Floor. As part of the IBS floor/ceiling assembly, the occupied zone floor slab, except at the utility pod, is not required to have an independent fire resistance rating. However, all penetrations shall be firestopped.

c) Other Structural Members. Primary structural members (supporting more than one floor) located within the distribution zone, such as columns and girders and trusses, shall have a 2-hour fire resistive rating or be protected in accordance with the fire resistance requirements of the Uniform Building

Code (reference 13p). Secondary structural members (supporting only one floor) within the distribution zone are not required to be fireproofed. Lateral and seismic bracing within the distribution zone need not be fireproofed provided these members do not carry vertical loads (live or dead).

NOTE: A full-scale fire test of the IBS structural assembly was conducted by NIST (NIST publication NBSIR 85-3158) for the VA in 1985 and again for a specific DoD project in 1995. Results of the 1985 NIST test determined that ALL structural steel within the interstitial space (distribution zone) is adequately protected for 2-hours by the walk-on platform/interstitial space arrangement without any direct fireproofing to the structural steel within the interstitial space.

13.14.2.6 Openings. To prevent fire and smoke migration into the distribution zone, openings through the walk-on platform shall be protected as follows:

a) All penetrations (ducts, pipe, cables, conduit, etc.) shall be firestopped at the walk-on platform with approved material in accordance with NBSIR 85-3158 (reference 13m), or with an approved through-penetration protection system.

b) Shafts shall be enclosed in properly rated construction and tightly sealed for the full perimeter of the penetration at the walk-on platform in accordance with NBSIR 85-3158 (reference 13m), or with an approved through-penetration protection system.

13.14.2.7 Ducts and Dampers.

a) Fire dampers are not required where ducts penetrate the 1 hour fire rated partition between the utility pod and the distribution zone.

b) Fire dampers are required where ducts penetrate 2 hour fire resistive partitions between the utility pod and the occupied and connection zones.

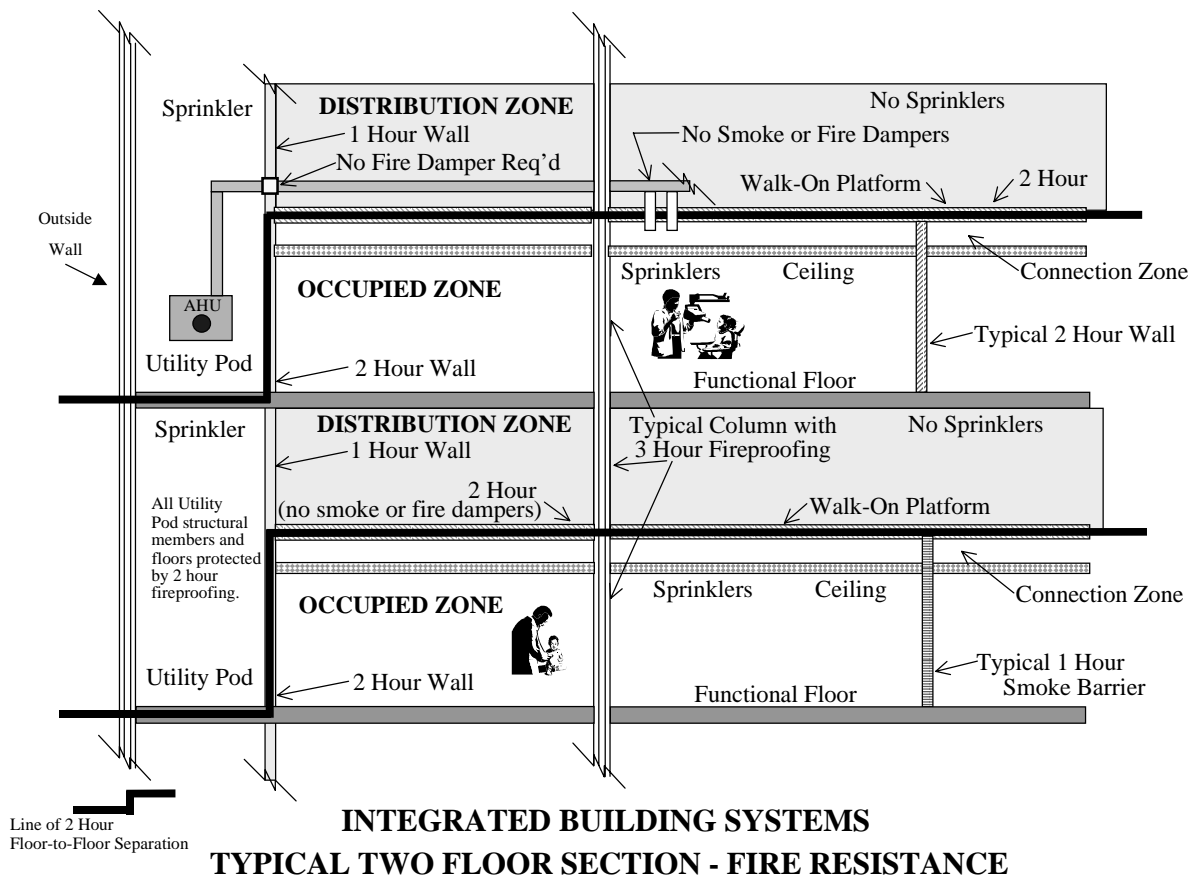
c) Fire dampers are not required in ducts for openings in the walk-on platform less than or equal to 150,000 sq. mm (225 sq. in). This includes supply ducts from the distribution zone to the occupied zone, exhaust ducts, and return ducts from the occupied zone to the distribution zone.

d) The total cumulative open space created by unprotected duct penetrations in the walk-on platform above any single smoke compartment or room in the occupied zone shall not exceed 0.98 percent of the area of the respective smoke compartment or room.

NOTE: This limit is provided as a design control feature to prevent over-penetrating a given area of walk-on platform with undampened duct penetrations. The value of 0.98 percent is based upon the percentage used in the 1985 NIST test and has been coordinated with the JCAHO Standards group.

e) Flexible duct work (Class 1-UL Standard 181) is permitted in the distribution zone for connections less than 2.4 m (8 ft.) long and shall be no larger than 300 mm (12 in.) in diameter.

f) Smoke dampers are required in ducts in the distribution zone where a duct serves more than one smoke compartment. Where required, the smoke damper shall be located in the duct at the approximate location where the smoke barrier is located below in the occupied zone.

**FIGURE 13-1****13.14.3 Sprinkler Systems.**

13.14.3.1 Approved automatic supervised sprinkler protection shall be provided throughout the occupied zone and in the utility pod. Sprinkler protection is not required in the distribution zone or the connection zone.

13.14.3.2 Fire alarm system supervision and annunciation of sprinkler system zones shall be coordinated with the compartmentation of each IBS module.

13.14.4 Standpipe Systems. Standpipes shall be provided in buildings when the top floor or top walk-on platform is greater than 10 m. (40 ft) above grade, or in buildings where fire department access is difficult. Standpipes shall be provided in accordance with NFPA 14 (reference 13s).

13.14.4.1 Each enclosed exit stair shall include an automatic Class-I standpipe. All hose connections shall be provided with 2½-inch hose valves with 2½-inch by 1½-inch reducing caps.

13.14.4.2 The sprinkler riser(s) for a module shall be combined with the standpipe riser(s) within the module. Hose outlets will be provided on the landings at the occupied zone at the entrances to the distribution zone located in the utility pod, and on each side of horizontal exit barriers.

13.14.5 Smoke Control and Management. Each facility shall be evaluated on an individual basis for the requirements for a smoke management system. Typically, the means to manage the flow of heat, smoke and other products of

combustion are inherent to IBS facilities. Building systems shall be coordinated and interfaced in accordance with NFPA 92A and NFPA 92B (references 13h and 13i) to achieve smoke control and management. "Smoke removal" is not considered an "engineered smoke control system."

13.14.5.1 Zoned smoke control shall be provided for IBS facilities provided with quick response sprinklers throughout smoke compartments with patient sleeping rooms and which are greater than two stories. Where inpatients can be evacuated directly outside without requiring assistance to traverse a vertical exit component, smoke control is not required. Performance criteria for smoke management shall be established for each facility.

13.14.5.2 Smoke management shall be provided for atriums, malls and other large volume spaces.

13.14.5.3 A means for purging the distribution zone of smoke and other products of combustion for post fire operations shall be provided. Typically a manual smoke purge system shall be provided for each individual system module with manual remote control available from the fire emergency control center.

13.14.5.4 Every effort shall be made to design all HVAC systems to be contained within an individual module. Smoke management should be zoned and annunciated by IBS module.

13.14.6 Fire Detection and Alarm Systems. Each project shall be evaluated to determine the need for detection systems in special areas using NFPA 101 (reference 13a) and NFPA 72 (reference 13g) for guidance. All fire protection devices shall annunciate at the fire emergency control center. System initiating device signals shall be annunciated by category of signal (alarm, supervision, trouble), type of device and location (floor and module).

13.14.6.1 System supervision and alarm zoning shall be coordinated with the fire and smoke compartments, and IBS zones of each module.

13.14.7 Distribution Zone.

13.14.7.1 IBS Concept. The distribution zone is an unoccupied space and shall not be utilized for any storage.

13.14.7.2 Access Door. An access door from each required exit stairway shall be provided to the distribution zone. Access doors shall be locked and accessible only by key. Each access door shall bear the sign "Storage in This Area is Prohibited by Order of the Fire Marshall." A similar sign shall also be placed inside the space.

13.14.7.3 Means of Egress. The access door is the primary means of egress for distribution zone occupants and shall meet the exit and ease of operability requirements of NFPA 101 (reference 13a).

13.14.7.4 Fire Alarm Features. Fire alarm devices located in the distribution zone are part of the module fire alarm evacuation system.

a) A manual pull station shall be provided in the distribution zone at each access door. Zoning for annunciation of this device shall be coordinated with the exit enclosure serving the module occupied zone. The manual pull station shall have an independent alarm annunciation zone.

b) Alarm indicating devices shall be provided for occupant notification throughout the distribution zone. Upon any alarm initiating

signal within a module, the indicating devices within the distribution zone of that module shall activate.

c) Smoke detection is required at each elevator access landing in the distribution zone. The smoke detector(s) shall be connected to the elevator controls and provide elevator response per NFPA 101 (reference 13a).

#### 13.14.7.5 Marking of Means of Egress.

a) Access aisles shall be delineated on the surface of the walk-on platform from the most remote point to the access door. Access aisles shall be painted yellow with direction arrows or cross-hatching indicating direction to the access door.

b) Exit signs shall be illuminated and located at each access door. Two signs shall be provided; one above the doorway and one adjacent to the doorway within 36 inches of the walk-on platform. Exit signs shall also be located along the access aisles. Exit signs shall be in accordance with the size and illumination requirements of NFPA 101, Section 5-10, "Marking of Means of Egress" (reference 13a).

13.14.7.6 Egress Lighting. Egress illumination shall be provided. The degree of illumination and location of lights shall be determined for each module.

13.14.7.7 Electrical Power. Exit signage and egress lighting shall be on life safety circuits and provided with standby or emergency power. Since the distribution zone space is normally unoccupied, key-operated light switches, located at each access doorway, shall activate normal lighting, egress illumination, and exit sign illumination within the module in accordance with NFPA 70 switch requirements for control of emergency lighting circuits. This shall minimize electrical usage and replacement of lamps in the distribution zone.

13.14.7.8 Cables and Conductors. All cables and conductors shall be run in metal cable trays in accordance with the requirements of NFPA 70 (reference 13n). The cables shall be segregated into separate compartments within each cable tray.

#### REFERENCES

13a. NFPA 101, "Safety to Life from Fire in Buildings and Structures" (Life Safety Code)

13b. MIL-HDBK-1008, "Fire Protection for Facilities Engineering, Design and Construction" (latest edition).

13c. Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Manual.

13d. NFPA 101A, "Guide to Alternative Approaches to Life Safety" (Fire Safety Evaluation System (FSSES))"

13e. NFPA 99, "Health Care Facilities"

13f. NFPA 90A, "Installation of Air Conditioning and Ventilation Systems"

13g. NFPA 72 "National Fire Alarm Code"

13h. NFPA 92A, "Smoke Control Systems"

- 13i NFPA 92B, "Smoke Management System in Malls, Atria, and Large Areas"
- 13j. NFPA 13, "Installation of Sprinkler Systems"
- 13k. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Equipment"
- 13l. NFPA 75, "Protection of Electronic, Computer/Data Processing Equipment"
- 13m. NBSIR 85-3158, "Fire Performance of Interstitial Space Construction Systems"
- 13n. NFPA 70, "National Electric Code"
- 13o. NFPA 220, "Types of Building Construction"
- 13p. ICBO (International Conference of Building Officials) Uniform Building Code (UBC)
- 13q. NFPA 241, "Safeguarding Construction, Alteration and Demolition Operations"
- 13r. ASME/ANSI A17.1, "Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks"
- 13s. NFPA 14, "Standpipe, Private Hydrant and Hose Systems."